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Is a Cashless Society Problematic?

by

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Abstract

The use of bank notes in Canada for payments has declined consistently for some time, and similar trends are evident in other countries. This has led some observers to predict a cashless society in the future. This paper considers the implications of the abandonment of the use of cash in the future. More specifically, we look at a variety of ways in which the emergence of a cashless society could affect key concerns of a central bank, including seigniorage, monetary policy, payments and financial stability considerations. We find that a cashless society would not generally cause material, system-wide problems. There are a few areas, however, where concerns could emerge: the maintenance of both operational reliability and contestability in retail payments, and the provision of a safe store of value in an (extreme) financial crisis. We note policy options to address these potential concerns.

Bank topics: Bank notes, Digital currencies, Financial services, Payment clearing and settlement systems
JEL codes: E, E4, E41, E42, E5

Résumé

L'utilisation des billets de banque comme moyen de paiement ne cesse de diminuer depuis un certain temps au Canada et d'autres pays connaissent des tendances similaires. Certains observateurs en viennent à prédire que nous finirons par vivre dans une société sans argent comptant. Dans cette étude, nous nous penchons sur les conséquences d'un abandon éventuel des billets. Plus précisément, nous examinons comment l'émergence d'une société sans argent comptant pourrait influer sur des questions primordiales pour les banques centrales, notamment le seigneuriage, la politique monétaire, les paiements et la stabilité financière. Nous constatons que, de manière générale, une telle société n'entraînerait pas de problèmes systémiques importants. Certains aspects pourraient toutefois devenir des sources de préoccupations, à savoir le maintien de la fiabilité opérationnelle et de la contestabilité des moyens de paiement de détail, ainsi que la mise à disposition d'une réserve de valeur sûre en cas de crise financière (sévère). Enfin, nous présentons différentes mesures de politique publique susceptibles de répondre à ces préoccupations éventuelles.

Sujets : Billets de banque; Monnaies numériques; Services financiers; Systèmes de compensation et de règlement des paiements
Codes JEL : E, E4, E41, E42, E5

1. Introduction

In some countries, most notably Sweden, the demand for cash has declined steadily over a sustained period. As households rely less and less on cash, merchants could be expected to become unwilling to accept cash as payment for goods and services, which would tend to further discourage the demand for cash. Indeed, this has been happening in Sweden. Further, financial institutions generally are reducing their cash operations to reduce costs, and in Sweden it has become increasingly difficult for the public to even obtain cash from banks. Indeed, many bank branches in Sweden have become cashless. Clearly, such developments tend to be mutually reinforcing and, over time, could lead to the emergence of an economy where cash is no longer used at all by individuals and firms, largely as a cumulative result of their own choices.

Central banks typically supply cash to meet public demand for bank notes, so a sustained decline in the demand for cash would cause central banks to face the following two sets of questions.

- Is a cashless society problematic? Does a cashless economy have adverse implications? What are the consequences for a central bank, the financial system and the economy?
- If a cashless society raises problems, what are reasonable responses? Should pre-emptive steps be taken to mitigate the potential erosion of the demand for cash, such as providing incentives for the public to continue to use cash or requiring financial institutions to provide cash services to the public? Should the central bank provide an electronic alternative to cash—a central bank digital currency (CBDC)?[1]

This paper examines the first set of questions—the implications of a cashless society, defined as an economy operating without publicly available bank notes issued by the central bank.[2] The next section sets out the facts about the demand for cash in Canada and considers the likelihood of a cashless society in the future. The paper then examines the implications of a cashless society for a number of central bank interests. Section 3 considers seigniorage, financial stability interventions and monetary policy. Payments are discussed in Section 4, and financial system stability in Section 5. Conclusions are presented in Section 6.

2. The demand for cash and the likelihood of a cashless society

As noted above, Sweden has attracted considerable attention because the demand for bank notes has been falling significantly over the past 10 years, raising the prospect that Sweden will become the first cashless society in the world. Indeed, Figure 1 shows that bank notes in circulation as a ratio of GDP in Sweden has been declining since the 1990s. As well, the value of notes in circulation began to decline in the early 2000s, driven mainly by the decrease in large-denomination notes, such as the SEK 1,000 note. More recently, the demand for SEK 500 notes has also started to decline. As a result, the Riksbank is investigating whether the disappearance of cash could cause problems, especially with respect to the payments system, and whether a

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[1] For a discussion of CBDC, see Engert and Fung (2017) and the references there.

[2] For clarity, central bank settlement balances or reserves are not relevant to this discussion, as they are not issued to the general public, and, more generally, there is no serious prospect that the use of reserves would erode.

digital complement to cash could support the Riksbank in promoting a safe and efficient payments system.[3]

For its part, Canada has been reported in the popular press and in industry reports to be one of the most cashless economies in the world, given the high percentage of the population that has access to electronic payment methods. For example, a 2013 study by MasterCard ranked Canada as one of the most cashless countries in the world, along with France and Belgium (Thomas, Jain and Angus 2013).[4] Similarly, ForexBonuses, focusing on indicators such as the number of credit cards per person and the volume of cashless transactions, concluded that Canada, Sweden and the United Kingdom are the most cashless countries in the world.[5]

2.1 What are the facts on cash in Canada?

The use of cash for payments has been declining for some time in Canada (Figure 2). Correspondingly, the use of electronic payment methods such as credit cards is increasing. These trends are summarized in Figure 3 and Figure 4. At the same time, the use of various payment innovations, such as contactless cards and Interac e-Transfer (a person-to-person—P2P—payment initiated by sending an email) has been increasing rapidly and will likely accelerate the relative decline of the use of cash, especially for P2P payments and for small-value transactions more generally (Fung, Huynh and Kosse 2017).

However, the overall demand for cash in Canada continues to grow at a rate similar to that of nominal GDP, so the cash-to-GDP ratio remains stable at around 3 to 4 per cent——a ratio that has persisted for more than three decades (Figure 5). Such steady demand for cash (relative to GDP) can also be observed in a number of other advanced economies (Bech et al. 2018). These trends contrast with the Swedish case, which is an outlier in this context.

The underlying composition of Canadian bank notes has changed significantly, however (Figure 5). Perhaps most notably, recent growth in the demand for cash has been driven by increased demand for higher-denomination notes, especially the $100 note. According to the Bank of Canada's 2013 Methods-of-Payment Survey (Henry, Huynh and Shen 2015), most consumers do not hold $100 notes in their wallets, which suggests that $100 notes are not generally used for payments. Also, the $100 notes are in general not available from ATMs and so must be withdrawn at bank tellers. These considerations suggest that these notes are most likely held for savings or for precautionary purposes. This behaviour could be encouraged by the sustained low interest rate environment, which means a low opportunity cost of holding cash. Evidence also suggests an increase in foreign demand for high-denomination Canadian bank notes. Similarly, an increase in foreign demand for large-denomination notes has been observed in Australia and the United Kingdom (Flannigan and Parsons 2018).

In sum, the use of cash for payments in Canada has been declining, especially compared with other (electronic) means of payment, which are increasingly important. But cash relative to GDP has been stable for decades. And the composition of the demand for bank notes has been shifting

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[3] See, for example, Sveriges Riksbank (2017).

[4] MasterCard, 2013, "The Cashless Journey". Available at https://newsroom.mastercard.com/wp-content/uploads/2013/09/Cashless-Journey_WhitePaper_FINAL.pdf

[5] See https://www.telegraph.co.uk/money/future-of-money/10-cashless-countries-world-does-uk-rank/ and www.forexbonuses.org/cashless-countries/.

somewhat toward larger-denomination notes, probably for savings or precautionary reasons, and possibly to satisfy increased foreign demand for larger-value notes.

2.2 Considering a cashless society

The use of cash for payments is likely to continue to decline in Canada as households and firms rely increasingly on electronic payment methods. This trend could be accelerated by the ongoing development and proliferation of mobile payment applications, which would encourage continuing adoption of electronic payments. Further, the Bank of Canada is expected to gradually increase its policy interest rate over the next few years. This would tend to increase the opportunity cost of holding cash for savings or precautionary reasons, which could dampen the demand for large-denomination notes especially. The drivers of increased foreign demand for larger Canadian bank notes are not clear, and such demand could slow down (or even reverse) in the foreseeable future. Taken together, these factors would discourage the demand for cash over time, so the ratio of cash to GDP could decrease somewhat in the coming years. And if the recent increase in foreign demand for large bank notes reversed, or if there were significant, sustained increases in interest rates, the decline in the use of cash could accelerate, and the ratio of cash to GDP could decline more rapidly than expected.[6]

Despite the likelihood of a continuing demand for cash, as a matter of prudence the rest of this paper considers the emergence of a cashless society. The focus is on how a cashless society could affect the key concerns of a central bank: seigniorage, monetary policy, payments and financial stability. Importantly, the premise underpinning this analysis is that individuals and firms decide to stop using cash—not that a cashless economy is forced upon society. In other words, the premise here is that the vast majority of individuals and firms (but perhaps not all) choose to abandon cash, and in response, the central bank stops printing it because of the large fixed costs inherent in supplying bank notes. Even though individuals and firms themselves choose to abandon cash, there could nevertheless be adverse collective outcomes.

In the cashless environment considered in this paper, the central bank would continue to supply settlement balances (reserves) to participants in the large-value payments system (typically major financial institutions), which would continue to provide settlement finality for (all) payments generally. And the transaction and store-of-wealth needs of the general public would be satisfied, much as they are currently, by digital money intermediated through the banking system (deposits).[7]

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[6] A continuing desire for anonymous transactions would likely support some ongoing residual demand for cash, the size of which would depend on how important such transactions were in the economy. See Kahn (2018) for a discussion on the importance of cash, focused on the (legitimate) role of privacy in transacting. Alternatively, some part of these transactions might migrate to private cryptocurrencies such as Bitcoin. (For more on Bitcoin usage in Canada, which is very small, see Henry, Huynh and Nicholls 2017, 2018.)

[7] As in other modern economies, almost all the money in the Canadian economy is created in the banking system. For example, cash in circulation in Canada is about $85 billion, while the (narrow) money supply measure M1++ (cash plus chequable and non-chequable notice deposits) amounts to $1,400 billion; so cash is only 6 per cent of this measure of the money supply (Bank of Canada, Banking and Financial Statistics, Table E1). For discussion of the economics of different types of money—such as cash ("outside money") and deposits ("inside money")—see Appendix 1.

The rest of this paper examines whether a cashless society would be problematic, viewed from a range of central bank interests.

3. Central bank seigniorage, financial stability intervention and monetary policy in a cashless society

3.1 Seigniorage

The disappearance of cash would lead to a contraction of the central bank's balance sheet, since cash is one of the principal liabilities of a central bank. Currently, bank notes represent around three-quarters of the Bank of Canada's liabilities, generally matched by asset holdings of Government of Canada securities. Such a balance sheet contraction would have a significant adverse impact on central bank seigniorage, which underpins central bank autonomy and is otherwise a material source of government revenue. But this revenue impact could be offset by other central bank actions, as discussed in Engert and Fung (2017) and Fung, Molico and Stuber (2014). Such steps could include charging more for the services provided by the Bank to the financial industry. Additional measures could also include expanding the central bank's balance sheet by buying government bills and bonds with reserves (similar to quantitative easing), to the extent that monetary policy objectives were not compromised and financial markets were not distorted.[8]

3.2 Certain financial stability interventions

One of the means for a central bank to provide liquidity in a financial crisis is to sell its holdings of government securities and purchase other (illiquid) assets with the proceeds.[9] (This also allows the central bank to increase the supply of high-quality securities in the market.) An unmitigated contraction of the central bank's balance sheet could compromise its ability to use this tool. As discussed above, however, a central bank could sustain the size of its balance sheet by purchasing government securities with reserves, and in a financial crisis such balance sheet expansion could be amplified, if required, including through coordinated action with the central government. (For additional discussion see Fung, Molico and Stuber 2014.)

More generally, regardless of the size of its balance sheet, a central bank could simply purchase a wide range of assets with reserves, without the need for prior liquidation of asset holdings (similar to the asset purchases in several countries, including the United States and the euro area, during the 2008–09 financial crisis).

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[8] For instance, while the demand for bank notes in Sweden has declined considerably over the past two decades, the size of the Riksbank's balance sheet has been expanding as a result of its asset purchase operations after the recent financial crisis. Engert and Fung (2017) suggest that the size of asset purchases needed to sustain central bank revenues in the absence of cash is unlikely to be material in the Canadian case.

[9] The Bank of Canada has general powers to purchase any securities or instruments to protect financial stability; see the *Bank of Canada Act*, section 18(g)(ii). Note that the transactions conducted by the Bank during the financial crisis of 2007–09 were various kinds of purchase and resale agreements (repos), and not outright asset purchases. (For more on this, see Zorn, Wilkins and Engert 2009.)

3.3 Monetary policy

Cash does not play a significant role in monetary policy, and so its disappearance generally would have no material adverse effect on monetary policy, including strategy, implementation or consequences (e.g., Freedman 2000; Woodford 2000). There are two caveats, however, including one potentially significant consideration. First, the disappearance of cash would have a minor operational impact in that there would be one less autonomous factor in the central bank's daily liquidity forecast. Second, and more importantly, a cashless society could open the door to the prospect of negative interest rates to a greater extent than is currently possible. Most central banks are obligated by law to supply cash to the general public. To the extent that the economy becomes cashless, a central bank could request a change in its governing legislation to remove the obligation to supply cash to the public on demand (which is a significant step). In that case, in the absence of cash and of an obligation to supply it, a central bank would be able to lower interest rates to a more negative level than is currently possible to achieve stabilization or price stability goals. (For an explanation of the link between cash and the effective lower bound on interest rates, see Witmer and Yang 2016, or Engert and Fung 2017.)

4. Payments in a cashless society

As a general matter, cash plays no role in large-value payments, so its disappearance would have no impact on the large-value payments system and related considerations. As noted above, in a cashless society, the central bank would provide settlement balances (reserves) for participants in the large-value payments system, as is currently the case (and has been for years). That is, participants would continue to use risk-free central bank money to settle payments with finality. The rest of this section therefore focuses on the implications of a cashless society for retail payments. There are a few areas of interest: the impact on specific parties, the robustness of retail payment networks, and the effect on competition in retail payment services.

4.1 Specific individuals and firms

Recall that the premise of this paper is that individuals and firms choose to abandon cash and prefer instead to rely on electronic payment mechanisms such as credit cards, e-transfers and automated funds transfers. It follows that these people and firms believe that the disappearance of cash would not adversely affect them; otherwise, they would not abandon cash. In time, however, this outcome could lead to adverse collective outcomes, such as reduced competition in retail payments (discussed below), or it could have adverse effects on certain cohorts of the population.

For instance, there could still be a small segment of the population that is able to use digital payment mechanisms but *prefers* cash—and whose demand is not sufficient to make a meaningful difference in aggregate. (As noted above, for example, a continuing desire for anonymous transactions would likely support some ongoing residual demand for cash. And some individuals could value self-imposed spending constraints afforded by cash.) As a result, such a minority of people and firms would be worse off because their choice set would be smaller without cash.

In contrast to such a cohort, there could also be small parts of the population that are forced to rely on cash, even if this is not their preference. Consider, for example, a geographically isolated population that relies on cash as a transaction medium because of the lack of reliable landline,

broadband or internet access necessary to conduct digital transactions (including Internet banking, e-transfers, debit and credit card transactions). The evidence, however, indicates that "nearly all Canadians (99.3 per cent) subscribed to either mobile wireless or landline telephone services in 2015," ranging from a high of 99.8 per cent of households in Alberta to a low of 98.5 per cent in New Brunswick (CRTC 2017, 61–64).[10]

There might also be a fraction of the population without bank accounts (for various reasons) who rely on cash for making payments rather than on transfers of digital bank balances. But again, the data indicate that the unbanked population in Canada is very small. In this regard, the 2013 Methods-of-Payment Survey conducted by the Bank of Canada indicates that 98 per cent of respondents have a bank account (Henry, Huynh and Shen 2015), suggesting that the vast majority of Canadians have access to banking services.

In sum, the disappearance of cash would not appear to present material problems in terms of access to payment means, given the near-universal availability of electronic services and bank accounts. Nevertheless, there could be grounds from a social welfare perspective for government (or its agencies) to provide for 100 per cent access (to the extent possible) to avoid excluding some individuals and firms from economic activity. Alternatively, bank notes could be made available to these very small cohorts of the population (at large cost); however, whether this would be a successful strategy is questionable. In an environment where cash had largely been abandoned, many businesses would be unlikely to accept or handle cash. In addition, it could become difficult to obtain cash from banks in an otherwise cashless economy, given banks' incentives to reduce cash-handling expenses as the demand for bank notes decreases.

4.2 Operational reliability of payments

As shown in Figure 3 and Figure 4, Canadians already rely on various electronic payment methods and affiliated networks for the vast majority of their retail payment transactions. For example, in 2017 about 90 per cent of retail payments value and 75 per cent of payments volume were via electronic payment methods. Of course, transactions between businesses are almost entirely dependent on electronic networks for clearing and settlement (including cheque processing). It follows that there is already significant dependence on the operational reliability of various electronic payment networks and associated power systems for day-to-day transactions in the economy.

The risks of such operational dependencies are mitigated in several ways. For instance, consumers use different payment mechanisms (e.g., debit or credit card systems), and even diversify across competing platforms (e.g., Visa, MasterCard and American Express in the credit card space). And the operators of these payment networks have strong incentives to ensure their operational reliability and business continuity to safeguard their businesses.

Further, major payment, clearing and settlement systems that are critical to the functioning of the economy, such as the large-value payments system, are subject to regulation and oversight by the Bank of Canada, including for operational risk and business continuity. The principal direct providers of payment services (typically deposit-taking institutions) are also subject to prudential

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[10] These data do not include information for Yukon, Northwest Territories and Nunavut; according to Statistics Canada's population estimates for the second quarter of 2018, these regions account for 0.3 per cent of the total Canadian population (Statistics Canada 2018).

regulation and supervision. And recently, the federal Department of Finance (2017a) proposed an oversight framework for retail payments in Canada more generally, including novel payment service providers, that includes provisions regarding operational risk.

Finally, cash provides a transaction medium that is robust to electronic network failures and power outages. In this regard, the average amount of cash held by individuals in their wallets ($84 in 2013) (Henry, Huynh and Shen 2015) exceeds the value of the average daily personal transaction ($62). This provides a buffer to help individuals cope with temporary disruptions of retail payment networks.

In a cashless society, there would be even greater dependence on the operational reliability of electronic retail payment networks and associated power systems than there is currently. This, in turn, points to the importance in a cashless society of the various risk-mitigation measures noted above, which include consumer use of different, competing payment networks. If concerns emerged in a cashless society with regard to operational reliability of (retail) payment networks, how could central banks and public authorities more generally respond?

> (i) Support the continuing availability of cash: To the extent that increased dependence on electronic payment networks would be a significant concern, the continuing availability of cash could help mitigate the impact of disruptions to electronic retail payment mechanisms. As well, there may be benefits from pre-emptive measures to mitigate an erosion of cash demand, such as providing incentives for the public to continue to use cash, improving the efficiency of the bank note distribution system, or, if necessary, requiring financial institutions to provide cash services as demanded by the public.
>
> (ii) Regulate private networks for operational risk and reliability, if warranted: As noted above, payment systems presenting critical risks to the economy are (already) subject to regulation. As a result, if dependence on specific networks in a cashless society presented critical risks, it follows that enhanced regulatory oversight could be expected.
>
> (iii) Issue a CBDC to provide an alternative payment mechanism: In this case, the central bank would provide a CBDC with a view to reducing reliance on private electronic retail payment networks in a cashless economy. Issuing a CBDC to reduce operational risk could require the CBDC to operate on an independent and separate network, which could reduce its utility. And a CBDC would similarly be subject to risks of network outages, power failures and cyber attacks. (Issuing CBDC would also have other implications, as discussed in Engert and Fung 2017.)

4.3 Competition in retail payments

As is well known, payments are characterized by significant economies of scale and network economics. That is, the more that individuals and firms use a particular payment method, the more useful and valuable it is to all participants, which sets up strong incentives for convergence to common mechanisms. As a result, payment services typically are consolidated among a small number of private networks linking numerous commercial participants (merchants) and payment service providers (generally banks). It follows that a high degree of network concentration is already the case in retail payments. For example, in Canada there is only one domestic debit card scheme, provided by Interac, which is owned by a consortium of banks. For credit cards in Canada, there are three major networks, operated by Visa, MasterCard and American Express.

Concentration of network service providers is not unique to retail payments; this outcome is characteristic of any market exhibiting significant economies of scale and network effects. For example, high concentration exists in a number of other markets with these characteristics, such as mobile phone service carriers and telecom generally, Internet services, electricity, and financial exchanges (such as stock or commodities markets) and central counterparties. In such cases, government regulation has been the standard response to competition concerns arising from market concentration.

Despite the small number of payment infrastructures, various payment service providers (for example, card issuers, typically banks) compete with each other to attract customers (purchasers of goods and services) who want to use these systems, by offering different bundles of services to customers. Similarly, other payment service providers (acquirers) compete as well to attract merchants to participate in these systems. As a result, contestability in payment services is not necessarily limited to consideration of the network infrastructures alone, but should also take into account related competition provided by the banks and other intermediaries providing access to those infrastructures. Further, different private networks—even with common participants—can compete with each other, particularly if they are subject to standards or expectations set by the public sector (for example, relating to access and transparency).

A cashless society would mean an environment where retail payment services are provided entirely by private sector networks. Currently, cash provides an alternative to digital payment networks, and this particular margin would be lost in a cashless society. Yet, as noted, there are various channels for competition in retail payment networks, which would continue in a cashless economy. However, contestability outcomes in a cashless society are highly uncertain, and future contestability is also subject to unpredictable developments in an evolving retail payments ecosystem.

So how could a central bank and other public authorities respond to concerns that might arise in a cashless society with regard to reduced contestability in retail payments? Again, there seem to be three options.

(i) Retain the obligation to make cash available when demanded by the public, or take pre-emptive measures to mitigate the erosion of cash demand: To the extent that there were concerns about adverse impacts on competition from the disappearance of cash, it could be useful for the central bank to retain the legal obligation to provide bank notes as demanded by the public. In the event that the public felt poorly served by private payment networks, cash might be reintroduced if demand increased. However, this strategy might not be entirely satisfactory given that the practices and technology to supply cash and support its use could atrophy over time in a cashless society. Therefore, this strategy could be supplemented by pre-emptive measures to mitigate the potential erosion of cash demand over time (as noted above).

(ii) Regulate retail payment networks for competitive outcomes: As noted above, regulation and standard setting are typical public policy responses for industries exhibiting scale and network economies where there are adverse impacts from concentration. Retail payment markets are already subject to public sector influence through, for example, the *Code of Conduct for the Credit and Debit Card Industry in Canada*. And, as noted, the Department of Finance (2017a) has recently proposed an

oversight framework for retail payments in Canada. In this regard, even a credible threat of regulatory intervention could restrain anti-competitive behaviour.

(iii) Issue a CBDC to compete with private networks: This would involve the central bank providing a publicly available digital currency to offer an alternative to private electronic payment networks, with a view to benefiting contestability in retail payments. (However, as indicated above, a CBDC would also have other implications; Engert and Fung 2017.)

5. A cashless society and financial system stability

This section considers potential (adverse) implications that could arise in a cashless society with regard to the financial system, in two respects: an erosion of market discipline without cash, and an absence of a medium of exchange in the event of financial system collapse.

5.1 Cash, bank runs and market discipline

The proposition considered here is whether cash provides an important source of market discipline in banking by creating the prospect of bank runs. In that case, if there were no cash, market discipline and banking system soundness could be compromised. In the following, this is considered from different perspectives, along with empirical evidence.

(a) Responses to bank stress and sources of ex ante discipline

If a bank's soundness is in doubt, depositors (retail and wholesale) of the troubled bank have three options to protect their assets. Each of the following is a means of "running" from the bank, and its possibility or prospect creates *ex ante* market discipline that discourages excessive bank risk taking.

Option 1: Withdraw cash from deposit accounts in the troubled bank. (This is the textbook bank run.)

Option 2: Transfer bank deposits to another bank; that is, use bank deposits in the troubled bank to electronically (or via cheque) purchase deposits in a sound bank.

Option 3: Use deposits in the troubled bank to purchase (safe) assets outside the banking system, such as a mutual fund of government debt securities or an outright treasury bill purchase.

Table 1 summarizes these three responses. Running to cash is one way to generate (*ex ante*) market discipline. But running to another bank (option 2) and running to other assets outside the banking system (option 3) are also possibilities and could be preferred by depositors. Creditors could also combine these options and sequence them in different ways. If a troubled bank were unable to execute one of these options, the authorities would intervene. For example, if the bank could not supply cash on demand (option 1), or defaulted in the payment system (option 2) or in the securities settlement system (option 3), or could not find a counterparty for such transactions, very likely the regulator would be obliged to intervene to resolve the bank.

Table 1: Depositor responses to a failing bank

Option	Are there frictions inhibiting this option?	Does this option provide a transaction medium?	Does this option provide a store of value?
1. Withdraw cash; i.e., purchase cash with bank deposits	Time cost (queuing), and security, storage and insurance costs	Yes	Yes, but incurs storage and insurance cost; no rate of return
2. Purchase a claim on a (sound) bank with bank deposits	Time cost and perhaps set-up fees to open another bank account and transfer deposit	Yes	Yes
3. Buy government debt through a mutual fund or outright with bank deposits	Time cost (can be done at own bank), perhaps set-up fee, some degree of financial literacy, market risk	No, but can be converted to transaction balances as required	Yes

As well, importantly, there are other prospective run mechanisms besides those noted in Table 1 that encourage prudent bank behaviour. For instance, there is a range of (sophisticated) counterparties in various markets (e.g., repo, foreign exchange [FX], swaps, other derivatives) who would also be expected to discipline bank risk taking by not transacting with a bank whose soundness was in doubt. Further, where creditors or counterparties were running from a bank (e.g., by not rolling over maturing short-term liabilities or by curtailing repo, FX or swap trades), there would probably also be a run on the troubled bank's stock, which provides another dimension for *ex ante* market discipline. Again, any of these outcomes is likely to lead to regulatory intervention.

Moreover, these various market discipline mechanisms are not the only means to establish prudent bank behaviour. Risky behaviour is also constrained by bank self-interest to preserve valuable bank franchises (charter values). Further, the heavy prudential regulation and supervision of banking also constrains risk taking *ex ante*.

In sum, the prospect of a depositor run to cash is not unique in providing for discipline *ex ante*. Other depositor run mechanisms exist, including transferring deposits to another bank or buying government debt. Runs can also occur in more sophisticated wholesale and counterparty markets, and on the bank's stock, which also creates discipline *ex ante*. Further, preservation of franchise value and prudential regulation also encourage prudent bank behaviour. Therefore, in a cashless society, other mechanisms would continue to constrain bank risk taking *ex ante*.[11] Finally, as discussed below, depositor runs to cash are, in fact, not very important in practice.

[11] Despite all these various discipline mechanisms, including the prospect of runs to cash, banks still find themselves under stress from time to time.

(b) System-wide risk taking and ex ante discipline

If depositors and other market participants believed that some banks were adopting imprudent strategies, they could exercise the options discussed above to protect their assets. Fears of these potential responses would provide *ex ante* discipline for banks. But what if all banks (and regulators) were myopic, for example, and converged on strategies to increase short-term profits by increasing risk at the expense of losses and even risk of insolvency in the longer term? In such an environment, it seems unlikely that depositors would behave in a less myopic way than everyone else. As a result, the prospect of depositors running to cash (or anywhere) is unlikely to be a meaningful constraint on risk taking in an environment of universally shared preferences for risk taking. Indeed, on the contrary, myopic banks would offer higher deposit rates to induce depositors to participate.

If, however, some depositors were less myopic than everyone else and sufficiently concerned about widespread risky bank behaviour, they could move a portion of their claims—despite being offered higher interest rates—into cash (bearing risks and storage costs) or into other assets outside the banking system, including government securities. This would force a contraction of bank balance sheets and constrain bank risk taking. (Some funds could periodically be transferred back into bank transaction balances, if required, to take advantage of bank transaction services, at a cost.)

In a cashless society, the possibility of moving a portion of deposits or other claims into assets outside the banking system would generate ex *ante* market discipline.[12] Further, transfers of assets out of the banking system could also be accompanied by adverse reactions in other markets, such as wholesale funding, repo, FX, swap and stock markets—which, in turn, would reinforce market discipline. (If such an environment persisted, "narrow banks" would be expected to offer fee-based payment services attached to deposits backed by low-risk securities, such as government securities.) Finally, the exit of funds from the banking system under such conditions, with associated banking system contraction (and adverse economic externalities), would also motivate regulatory intervention.

In sum, again, an absence of cash would not preclude other mechanisms from constraining risk taking *ex ante*.

(c) Empirical evidence on depositor runs to cash

What is the empirical evidence on the importance of retail runs, runs of small depositors or runs to cash? Canada has had limited experience with episodes of significant financial instability, so the focus in this section is initially on experience in the United States and the United Kingdom.

Rose (2015) surveys the experience in the United States with bank deposit runs in 2008 and compares them to such runs in the 1930s. He shows that the deposit runs in 2008 to a great extent comprised outflows from large depositors, such as corporations with payroll and other transaction accounts. In value terms, deposits at US banks are heavily concentrated in a small number of large accounts. While such uninsured accounts are held by a variety of depositors, large firms are an especially important group, and large-value business outflows were particularly important in the US banking system in 2008. Rose (2015) notes that there were other

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[12] For clarity, aggregate bank deposits and assets would be reduced in this process to the extent that bank deposits were used to purchase government bonds, for example, from banks' own portfolios.

market sources of liquidity pressures on US banks in addition to large-value deposit outflows, including runs in the repo market and in the asset-backed commercial paper market.

In addition, Rose (2015) shows that this critical role for large depositors is a long-standing characteristic of US banking history. In the early 1930s, even though small depositors lined up outside banks, outflows in that era were to a large extent also due to major accounts. And large depositors, even in the 1930s, were not constrained to standing in queues to withdraw cash: these large accounts were more likely to hold chequing accounts (e.g., business payroll accounts) than savings accounts, and could therefore write cheques for deposit in other banks or to purchase securities. Indeed, this distinction featured in Congressional testimony in the 1930s regarding the establishment of deposit insurance in the United States. For example, in describing the nature of deposit runs, the president of Chemical Bank testified that:

> The smart fellow gets out first and he is the big depositor. What we call the national money, the big chain stores and tobacco companies and that type of people, they get out first, long before the little fellow ever hears of it.... You see the [small depositor] walk in the door to get his money. You do not see the large depositor that checks his out that goes through the clearing house (Rose, 2015, 23).

It is important to note also that this experience predates the existence of deposit insurance, the creation of which has further reduced the secondary disciplinary role played by retail runs to cash.

The case of Northern Rock in the United Kingdom is one of the most well-known episodes of a recent bank run, with pictures famously broadcast in late 2007 of retail depositors lining up at Northern Rock branches to claim their cash. But as Shin (2009, 102) notes,

> the Northern Rock depositor run, although dramatic on television, was an event in the *aftermath* of the liquidity crisis at Northern Rock, rather than the event that triggered its liquidity crisis. In this sense, the Northern Rock episode was not an old-fashioned bank run of the sort we see in movies like *It's a Wonderful Life* or *Mary Poppins*.

Shin shows that wholesale runs were critical in the Northern Rock case, and, while some types of retail runs played a role, in-branch runs to cash were not significant. The retail deposits that declined the most in the second half of 2007, after the initial damaging runs of wholesale depositors, were not retail branch-based deposits (i.e., runs to cash) but declines of postal account deposits, offshore deposits, and telephone and Internet deposits.[13] In contrast, conventional branch-based deposits—runs to cash—declined the least and were relatively unimportant. As Shin (2009, 102) summarizes, "the irony of the images of Northern Rock's retail customers standing in line to withdraw deposits is that retail deposit funding is perhaps the most stable form of funding available to a bank."

In sum, these historical experiences show that the discipline from deposit runs specifically comes mainly from large, uninsured deposits, and not from depositor lineups to withdraw cash. What matters most in terms of market discipline from depositors is the behaviour of wholesale, large-

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[13] Postal accounts in the United Kingdom required customers to send in their deposit or withdrawal requests by mail; telephone accounts operated similarly, but by phone. Customers earned a higher interest rate for the related inconvenience.

value creditors, who do not generate runs for cash, and this appears to have been true for decades—even before the existence of deposit insurance.

There is relatively little Canadian experience of significant bank runs to inform this discussion. But the well-known failures of the Canadian Commercial Bank (CCB) and the Northland Bank in 1985 were preceded by several runs of wholesale, non-personal deposits.[14] These banks were relatively small but grew rapidly in the early 1980s by taking on considerable risk, in particular by lending to subprime commercial firms and speculative energy-related real estate projects. They also had weak corporate governance practices, and engaged in aggressive accounting practices to present an appearance of profitability. For funding, these regional banks relied on wholesale money market deposits, which were large and mostly uninsured. This, together with the banks' vulnerability to falling real economic activity and real estate prices, left them highly prone to liquidity shortages.

In fact, the CCB had difficulty accessing funds from the market on several occasions before 1985. And in early 1985, the disclosure of material losses prompted another run on the CCB's wholesale (non-personal) deposits. Money markets also lost confidence in the Northland Bank, suspecting that it was in a similarly unsound financial position. The liquidity problems that started at the CCB and the Northland Bank subsequently spread to other small regional banks, when wholesale funding was also pulled out of other regional banks that appeared to have business models similar to those of the CCB and Northland. By September 1985, both the CCB and the Northland Bank were declared insolvent and closed. In sum, liquidity runs in this episode were focused on wholesale (non-personal) deposits, not on retail runs to cash.

A more recent Canadian episode was the deposit run on Home Capital, an institution that specializes in mortgage finance, in the spring and summer of 2017. Home Capital relied heavily on brokered deposits for funding; for example, in late 2016 almost 85 per cent of Home Capital's deposit funding was through broker channels (DBRS 2017). It follows that the run on Home Capital deposits in 2017 was largely in brokered deposits as well, through (electronic) transfers from Home Capital to deposits at other financial institutions (and not retail runs to cash).

(d) Additional policy considerations

As a practical matter, policy-makers have taken steps to protect retail depositors and to inhibit related depositor runs. Canadian authorities designated the six largest Canadian banks as domestic systemically important banks (D-SIBs),[15]and they established an "open-bank" bail-in resolution regime for these banks, which exempts deposits. The following measures discourage deposit runs from acting as a market discipline mechanism:

- Deposit insurance (with generous limits) exists in Canada to explicitly protect depositors from loss (credit risk), which reduces their incentive to run. Depositors are still subject to

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[14] For a detailed account of this episode and its consequences, see Chant et al. (2003), which is followed here.

[15] As noted in the backgrounder published with the federal bail-in regulations in June 2017, "the 2008 financial crisis highlighted the fact that some banks are 'systemically important'—so important to the functioning of either the global financial system or to a domestic economy that their failure would impose unacceptable costs on the economy and financial system and, potentially, taxpayers" (Department of Finance, 2017b.

modest liquidity risk in this context due to the short lag between failed bank closure and deposit insurance payout. (Where resolution of a failed bank requires payout of deposit insurance, the Canada Deposit Insurance Corporation aims to make such payouts within three days; see the frequently asked questions on the CDIC website.)

- Under the recently developed bail-in framework, the government established provisions to resolve a failing D-SIB on an open-bank basis by converting certain of its debt into common shares to recapitalize the bank and help restore it to viability. Under these provisions, a failing D-SIB would not be closed or wound up as in a conventional bankruptcy proceeding.
- As part of the bail-in framework, D-SIBs must issue a minimum amount of total loss-absorbing capital, consisting of common equity, preferred shares, subordinated debt and specific bail-in bonds. Preferred shares, subordinated debt and bail-in bonds would be subject to conversion to common equity in resolution, and subject to risk of loss, as would original common equity. But deposits have been explicitly carved out of the bail-in provisions; that is, depositors are protected because they are not subject to the bail-in regime. The policy objective is that the D-SIB would be recapitalized while remaining open and operating as a going concern. (See Appendix 2 for more on the bail-in regime.)[16]

5.2 The utility of cash after banking system breakdown

(a) Basic considerations

In the case of widespread bank failures or systemic financial collapse, where the banking system has collapsed and the use of deposits as money has been compromised, cash would have increased utility, not to create *ex ante* discipline and bank soundness—it would be too late for that—but as a means of providing a trusted transaction medium or store of wealth. In the extreme, however, the stock of readily available cash probably would be insufficient in this scenario, depending on the amount of cash held in reserve by the central bank.[17] That is, a central bank probably would not have a sufficient inventory of bank notes in reserve to meet a sudden, large surge in demand for cash under such circumstances, and filling an order of new notes typically would take a considerable amount of time. So, if cash were the only means of payment available, there would have to be a significant decline in the price level for the readily available

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[16] In addition to bail-in provisions, CDIC also has other broad powers to provide guarantees for the liabilities of a bank in resolution as required (see, for example, the *CDIC Act*, section 10). As well, the federal government has separate, broad legislative powers to provide capital (purchase shares) in a bank; see section 973 of the *Bank Act*. And the Bank of Canada has general powers to purchase any securities or instruments to protect financial stability; see *Bank of Canada Act*, section 18(g)(ii). Further, federal authorities could implement a range of other measures to support the financial sector if required, as was demonstrated in 2008–10, including purchases, through the Canada Mortgage and Housing Corporation, of pools of insured residential mortgages from Canadian financial institutions (Zorn, Wilkins and Engert 2009).

[17] As noted above, total bank notes in circulation in the Canadian economy amount to $85 billion, while Canadian-dollar demand and notice deposits alone at only TD Bank are about $260 billion (January 2018; regulatory data). Again, a narrow measure of the money supply (M1++) is around $1,400 billion.

stock of cash to provide sufficient real balances under highly extreme conditions of unmitigated financial system breakdown.

However, the negative externalities for the broader economy from financial system collapse would be immense. Therefore, the government would probably intervene to inhibit or mitigate such an extreme outcome (using, for example, the powers noted in footnote 16). This in turn would moderate the demand for cash in an extreme crisis environment. Nevertheless, it would appear that under such conditions, an increase in the demand for cash could be expected. If such an extreme environment were considered to be a relevant risk, a readiness to provide an adequate supply of bank notes, together with the requisite government intervention, might be considered.[18] The next section informs this discussion by drawing on experience from the 2008 financial crisis, with a particular focus on Iceland.

(b) Lessons from the financial crisis, and the case of Iceland

The financial crisis that began in 2008 appears to have had an incremental impact on the demand for central bank notes in the major affected countries. Bech et al. (2018) show that the ratio of cash to GDP increased in advanced economies following the financial crisis, and they find a structural break in cash demand in 2007–08 for advanced economies (but not for emerging-market economies). They conclude that "the continuing demand for cash has been especially noticeable in advanced economies since the start of the great financial crisis, and is likely driven by store-of-value motives rather than payment needs" (77).

The case of Iceland is especially striking and informative in this context. Between 2008 and 2010 Iceland experienced what could reasonably be considered a financial system collapse, when all of the major banks and savings banks in Iceland failed (Kristinsson 2012). While significant government intervention aimed to mitigate the severe economic costs of the crisis, GDP nevertheless declined by over 11 per cent in the two years after 2008 (Guðmundsson 2016).

Of particular interest is the collapse and management of the three largest Icelandic banks; these banks accounted for almost 90 per cent of banking system assets before they failed in 2008. In less than five years, from the end of 2003 to mid-2008, the combined assets of these three banks went from under two times GDP to almost 10 times GDP, with about two-thirds of their combined balance sheet denominated in foreign currency (Guðmundsson 2011, 2016). As the collapse of the major banks became imminent, in early October 2008 the Icelandic government passed legislation with two major features. First, it gave depositors creditor priority (seniority) to rank ahead of other secured creditors. Second, the Icelandic Financial Stability Authority (FSA) was given unprecedented intervention authority. The FSA then took over the three largest Icelandic banks and split each bank into two parts: a new domestic bank and a residual holding company. (For more on these events, see Central Bank of Iceland 2009; Guðmundsson 2016; and Benediktsdóttir, Eggertsson and Þórarinsson 2017).

These three new domestic banks took on the domestic deposits of their predecessor banks, and most of the domestic assets of the former major banks were also transferred to the newly created banks, at a substantial discount. The government refinanced the new banks with equity injections and subordinated loans amounting to about 12 per cent of GDP. The government then took

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[18] The bank note distribution system in Canada (and in other countries) also depends on some functionality of the banking system.

partial ownership of the new banks, according to the amount of financing that it had provided. Remaining assets and liabilities were left in three holding companies and went into a resolution process.

The government guaranteed all domestic deposits in Icelandic banks, and the Central Bank of Iceland issued a statement to the international credit card companies, guaranteeing settlement between card issuers and acquirers so that acquirers would be able to demonstrate their ability to meet domestic obligations (Central Bank of Iceland 2009). Further, the central bank guaranteed credit card acquirers access to foreign exchange so that they could fulfill their cross-border commitments arising from Icelanders' card use abroad. In the event, electronic payment methods continued to be used, although the data (Figure 6) also show the impact of the large economic and financial shocks affecting Iceland. Finally, capital controls were imposed in November 2008 to stem capital flight, in conjunction with an International Monetary Fund program.

Given this range of interventions, including restructuring and underwriting of the three major banks, guaranteeing all domestic deposits and guaranteeing payments to credit card companies, the domestic operations of the major banks were never interrupted and the domestic payment system was preserved, which were central goals of the Icelandic authorities (Guðmundsson 2016).

In this environment of extreme crisis, the demand for bank notes initially increased significantly in late September and early October, with cash in circulation more than doubling (Figure 7), until the interventions described above were taken, which arrested that process.[19] To help meet this increased demand, the Central Bank of Iceland was forced to use reserve supplies of bank notes that had been withdrawn from general circulation (Central Bank of Iceland 2009). The increase in demand for bank notes was concentrated in the largest denominations, suggesting that it was driven more by store-of-value motivations and less by transactions demand. Given the pressures on the supply of bank notes, the central bank also considered allowing depositors who had withdrawn cash from banks to deposit their notes into accounts with the central bank (Central Bank of Iceland 2009). (Had this measure been implemented, it would have allowed individuals and firms to, in effect, hold an account-based central bank money, essentially a form of CBDC.)

Finally, and corresponding to the increased demand for cash as a store of value, domestic time deposits in the banking system decreased (Figure 8); however, demand and notice deposits *increased*, so there was a moderate upward trend in total domestic deposits.[20]

(c) Implications for a cashless society

An increased demand for a risk-free asset, such as cash, seems likely in a systemic banking collapse. Based on experience during the 2008 financial crisis in a range of countries, this would appear to be motivated largely by store-of-value or precautionary needs. This suggests that large-

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[19] This increase in the demand for cash was preceded by significant pressures on the Icelandic banks in major markets. For example, for months they had been having difficulties securing foreign funding, and their shares had been under severe pressure (Benediktsdóttir, Eggertsson and Þórarinsson 2017).

[20] Monthly aggregate balance sheet data of deposit-taking corporations in Iceland indicate that liabilities such as domestic securities and domestic derivatives declined by more than 75 per cent in October 2008, while domestic deposits that were guaranteed by the government increased by over 12 per cent.

denomination notes would be most relevant in such an event, and the increase in demand could be large compared with the stock of notes in circulation. But in a cashless society, how would such an increased demand for risk-free assets be managed best? There seem to be three options to consider, which are not necessarily exclusive, along with a number of questions.

> (i) Continue to make cash available, or reintroduce cash in a crisis: Would the reintroduction of physical central bank notes in a cashless society during a financial crisis be effective? In a cashless society, is it a reasonable policy to have the central bank store a large quantity of high-denomination bank notes as a contingency to respond to a tail-event financial crisis? How much bank note inventory should a central bank hold to meet a potential increase in demand during a systemic financial crisis, particularly if the demand for cash is small in normal times?
>
> (ii) Rely on government securities as a safe store of value: Since financial crises are very low-probability tail events, would it be reasonable and effective to rely on government securities (electronic or physical) to meet safe-asset, store-of-value needs in the event? Should the government consider issuing securities in smaller denominations to provide wider access to the general public? (Under such conditions, new intermediaries might also develop that would facilitate transactions by transferring claims on portfolios of government bonds.)
>
> (iii) Rely on a CBDC: Would ongoing issuance of a CBDC, such as the benchmark (non-interest bearing) CBDC discussed in Engert and Fung (2017), be a suitable way to mitigate such a contingency tail risk?

The assessment of these strategies requires analysis of their costs and benefits, and this is left for future research. These considerations might also suggest some more fundamental questions: Is the central bank obliged to provide a safe store of value for depositors in a financial crisis? What would happen to the financial system and the broader economy if there were no central bank money to run to? Would that inhibit runs in a systemic crisis? Would there be adverse outcomes (such as higher risk premiums or runs to foreign currencies)?

5.3 Summing up

The key conclusions from this section are as follows:

- The prospect of a run from bank deposits to cash can provide *ex ante* market discipline. But this is not the only run mechanism that can provide such discipline, nor are runs to cash the most likely or most important mechanism. Indeed, the empirical evidence is that retail runs to cash are relatively unimportant for market discipline. In a cashless society, there would still be a range of (more important) market discipline mechanisms, and banks' own incentives to preserve their franchise values, as well as prudential regulation and supervision, to constrain bank risk taking *ex ante*.
- The environment where cash is likely to be most useful—a collapse of the financial system—is likely to be strongly resisted by government. Indeed, financial stability is widely regarded as an important public good, which suggests that preserving the functioning of the system would be a priority, and this is borne out by experience.
- Nevertheless, in a crisis environment, an increase in demand for a safe asset, principally as a store of value, could be expected. And this increased demand could be significant,

depending on the nature of the financial collapse and the official response. Future work could consider which options noted above might best address such a contingency.

6. Conclusions

The use of cash for payments has been declining in Canada, especially compared with other (electronic) means of payment, but cash demand as a share of GDP has been stable for decades. The composition of bank note demand has been shifting toward larger-denomination notes, probably for savings or precautionary reasons, and perhaps to satisfy increased foreign demand for larger-value notes. Looking ahead, the use of cash for payments is likely to continue to decline in Canada as reliance on electronic payment methods continues to grow. In addition, possibly higher future interest rates could dampen demand for bank notes, and foreign demand could slow in the foreseeable future. As a result, the demand for bank notes, and the ratio of cash to GDP, could decrease somewhat in the coming years. If the recent increase in foreign demand for larger bank notes reversed, or if interest rates increased substantially, the decline in cash use could accelerate, and the ratio of cash to GDP could decline more rapidly than expected. If Canadians generally abandoned cash, would that be problematic?

This paper considers a variety of ways in which the emergence of a cashless society could affect key concerns of a central bank, including seigniorage, monetary policy, payments and financial stability considerations. For clarity, the premise in this paper is that the vast majority of individuals and firms would choose to abandon cash—not that a cashless economy would be imposed. The conjecture here is that in response to these private choices, the central bank could decide to stop providing bank notes because of the large fixed costs inherent in producing and distributing cash. Under such conditions, transactions and store-of-wealth needs would be satisfied much as they are now, by digital money intermediated through the banking system—that is, deposits. And even though a cashless society could emerge as a result of voluntary, individual choices, there could be adverse collective consequences from such an outcome, which might require public policy responses.

There is already near-universal access to electronic services and banking in Canada (and likely in some other countries as well). And with greater reliance on electronic payments over time, such access may increase further. In a cashless society, however, there could be grounds to provide for 100 per cent access (to the extent possible) to digital service channels or continue cash availability to avoid excluding some individuals and firms from economic activity.

We find that a cashless society would not generally cause material system-wide problems. But given the increased dependence on retail payment networks in a cashless society, concerns might arise with regard to the maintenance of operational reliability, and with regard to contestability in retail payments. As well, there could be a need to provide a safe store of value in an (extreme) financial crisis. As regards policy responses, three options were presented for these potential concerns.

- If operational reliability or contestability in retail payments were deficient in a cashless society: (i) retain the obligation to make cash available, and consider pre-emptive measures to mitigate the potential erosion of cash demand over time; (ii) regulate critical payment networks if warranted to support operational reliability and to mitigate anti-competitive outcomes; (iii) issue a central bank digital currency to compete with private payment networks.

- To provide a safe store of value in a financial crisis: (i) continue to make cash available, or reintroduce cash in a crisis; (ii) rely on government securities as a safe store of value in a crisis; (iii) rely on a CBDC.

Future work could consider the best policy responses in these cases.

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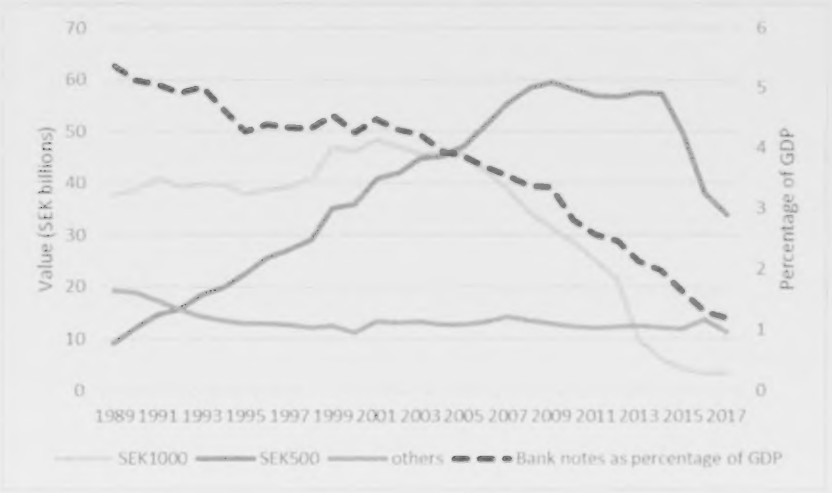
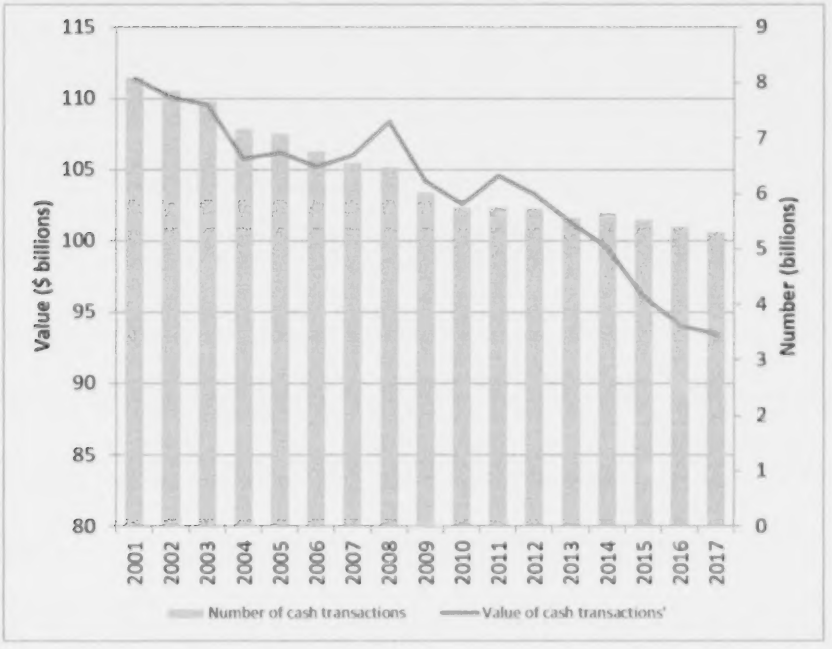
Figure 1: Bank notes in circulation in Sweden (1989–2017)



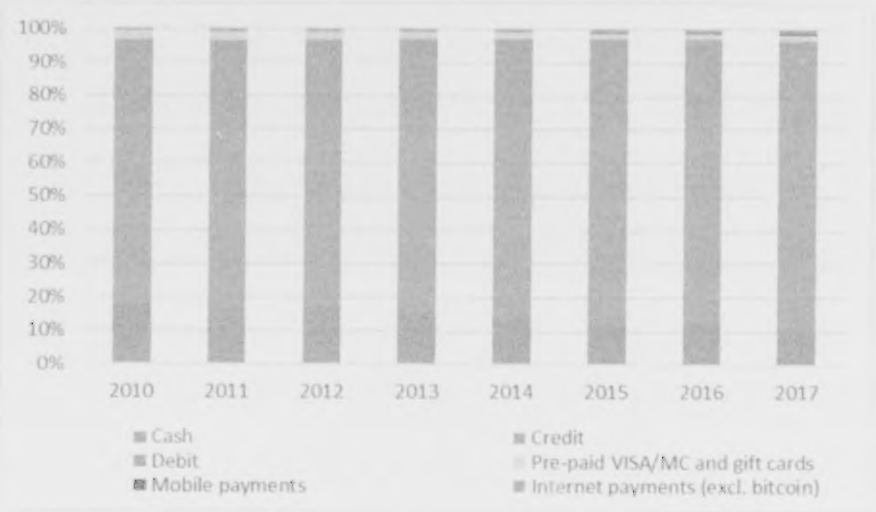
Sources: Bank for International Settlements and Sveriges Riksbank

Figure 2: Cash payments in Canada



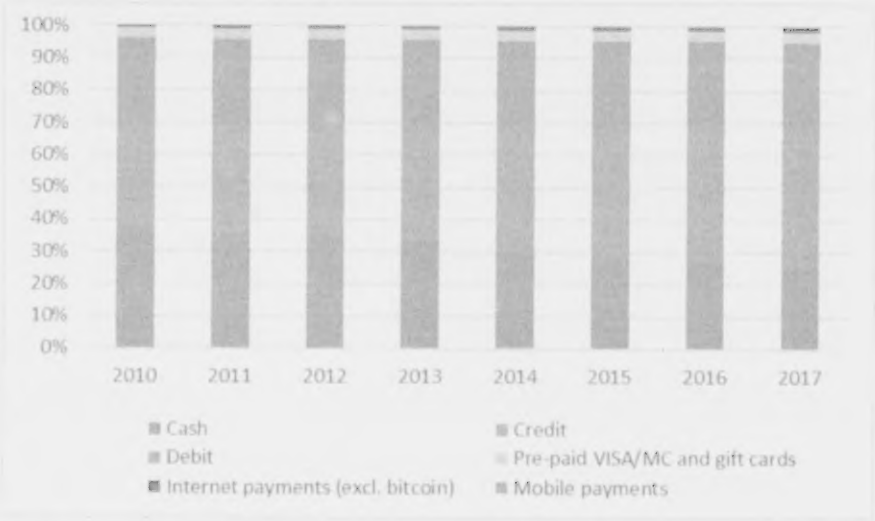
Source: TSI International

Figure 3: Payment shares by value in Canada



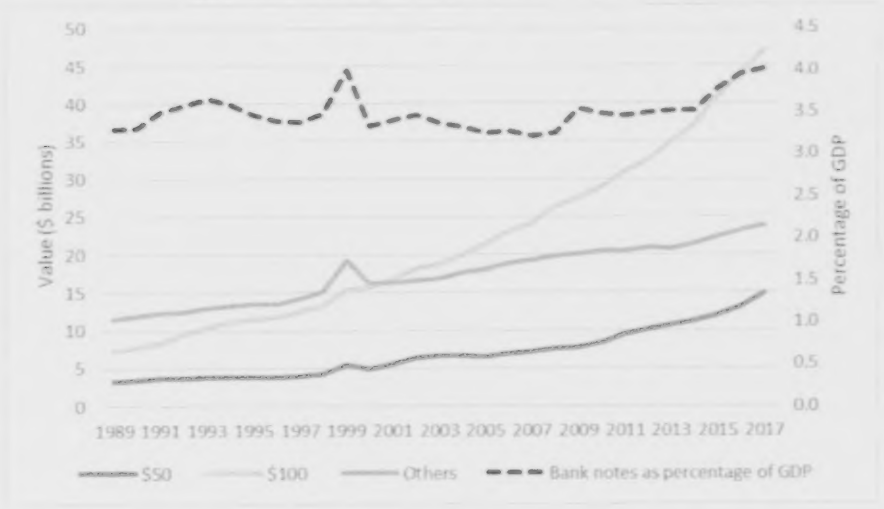
Source: Canadian Financial Monitor

Figure 4: Payment shares by volume in Canada



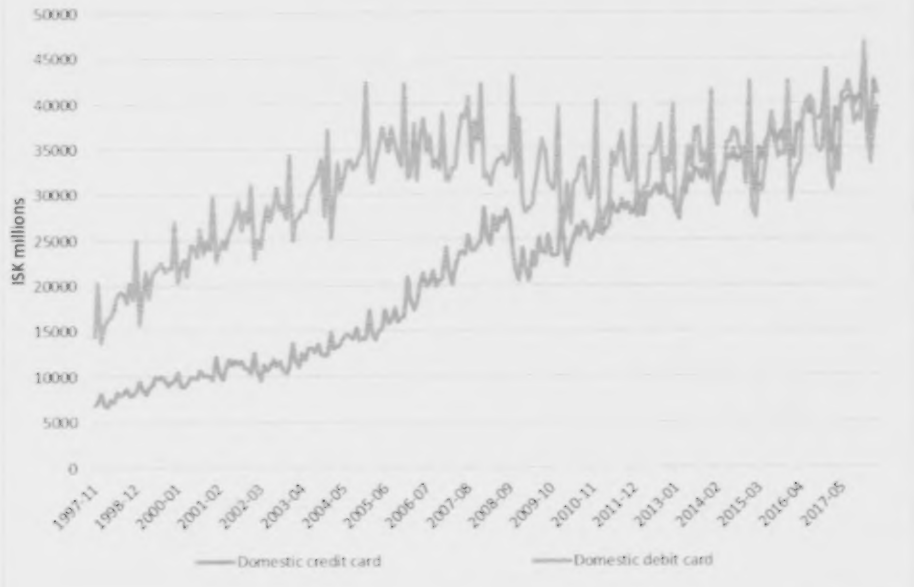
Source: Canadian Financial Monitor

Figure 5: Bank notes in circulation in Canada



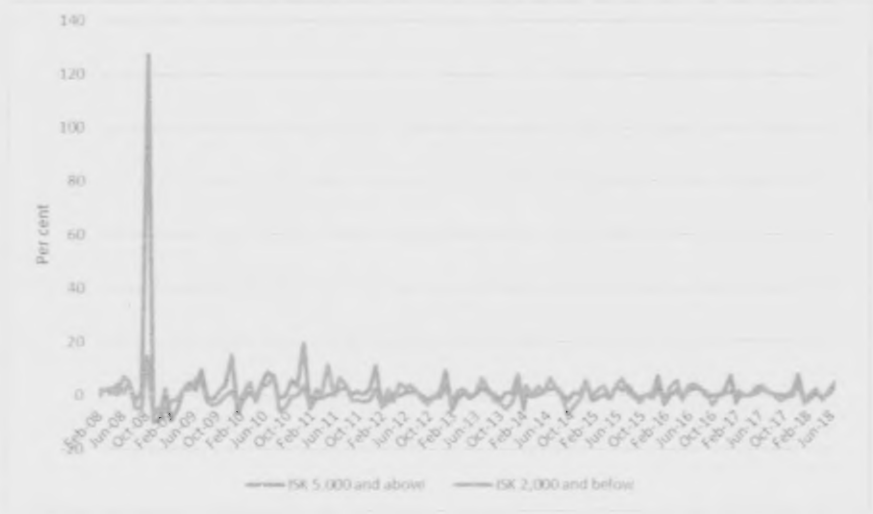
Source: Bank of Canada

Figure 6: Value of debit cards and credit cards transactions in Iceland



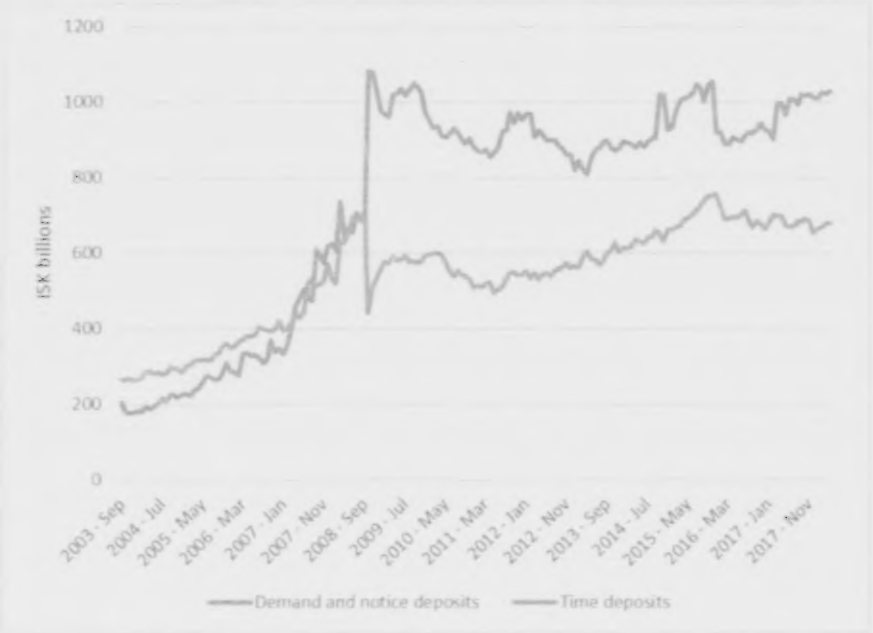
Source: Central Bank of Iceland

Figure 7: Monthly change in bank note demand by denomination in Iceland (2008–18)



Source: Central Bank of Iceland

Figure 8: Bank deposits in Iceland



Source: Central Bank of Iceland

Appendix 1: Inside Money and Outside Money

As is well known, money is an asset that is used as a medium of exchange and a store of value. Different kinds of money discussed in this paper—bank deposits on the one hand, and central bank notes (cash) and central bank reserves on the other hand—are usefully considered as "inside money" and "outside money," respectively (Lagos 2006).

- *Inside money* is an asset used as a medium of exchange that is fully backed by claims on private agents. That is, inside money is essentially private debt that circulates as a medium of exchange. Since inside money is an (intermediated) asset backed completely by private liabilities, it is in zero net supply in the private sector. Bank deposits are inside money: they are private debt, backed by bank assets, which is broadly used as a medium of exchange and a store of value.
- In contrast, *outside money* is not backed by private liabilities. Commodity money (such as gold), government-issued money backed by specie or by government debt, and fiat money (which is unbacked) are not created by generating private liabilities.[21] Cash and digital settlement (reserve) balances, both issued by the central bank (and so outside of the private system), are outside money. Of these two categories of outside central bank money, only cash is made widely available to the public, while settlement balances are used by participants in the large-value payments system to settle payments with finality on the books of the central bank. (For more on this, see Engert and Fung 2017.)

As noted above, almost all of the money used in a modern economy is inside money created by the banking system. Therefore, one way to interpret the prospect of a cashless society is that a particular kind of outside money (cash) falls into disuse and even greater reliance is placed on inside money (deposits), which already accounts for almost all of the money in Canada.

Why do both outside and inside money exist? Why is the stock of inside money so much larger than that of outside money? As pointed out by McLeay, Radia and Thomas (2014), under certain special conditions there would be no need for money at all: everyone in the economy could issue their own personal IOU every time they wanted to purchase something, and keep track in their own ledgers what was owed to whom. Aside from the complexity of such an arrangement, such an economy would depend on everyone being trustworthy—on their IOUs being a credible promise.[22]

Without unquestioned mutual trust in this economy, trading efficiency would deteriorate (with, for example, variable IOU-discounting), and the system could break down. Even if people trusted everyone who gave them an IOU, they would worry that their counterparties held IOUs from untrustworthy people and therefore their counterparties might not be able to repay their

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[21] Bitcoin can also be considered outside money, although it is private money (e.g., Garratt and Wallace 2016).

[22] Consider this example of this kind of economy: Annie has apples but wants bananas. Bill is growing bananas that he will harvest in a week, and he wants an apple pie for tomorrow's dinner. Pat knows how to bake an apple pie but needs apples to do that. Bill knows Annie, and he gives her a bananas-IOU (due in a week) in exchange for an apples-IOU from Annie. Then Bill trades his Annie-apples-IOU for a pie-IOU from Pat. And then Pat redeems the apples-IOU from Annie and uses some of those apples to bake a pie for Bill, which he redeems with his pie-IOU tomorrow. (Pat eats the rest of the apples.) Then in a week, Annie redeems her bananas-IOU from Bill for some fresh bananas.

own IOUs. As a result, in all but the most basic or primitive conditions (such as a family or small village), a system based on universal trust probably cannot be sustained. And a system that depends on a high degree of universal trust is very unlikely to emerge in an environment of many anonymous agents. As a result, unless this friction—a lack of trust—is overcome, trade, consumption and investment would remain relatively low in the economy.

In a series of papers, Kiyotaki and Moore (2001, 2003, 2005) study the conditions under which private debt (e.g., claims on proceeds from an investment project) can reliably act as a medium of exchange—that is, as money. Kiyotaki and Moore emphasize the importance of agents' ability to make credible bilateral and multilateral commitments through various institutional arrangements. On the one hand, there can be a limit on the ability of borrowers to credibly promise to repay a lender who provides financing; that is, there can be a limit on the degree of bilateral commitment. As well, there can be a limit on the ability of the initial lender to credibly promise to repay any bearer (holder) of the loan; that is, there can be a limit on the degree of multilateral commitment, which influences the transferability of the private debt. The extent of bilateral commitment in an economy (from borrower to lender) places a limit on the total stock of private debt in the economy, and the extent of multilateral commitment (from lender to any holder of the paper) determines how much private debt can circulate generally and act as a medium of exchange.

Credibly solving these problems leads to the existence of particular institutions—banks—that specialize in generating bilateral and multilateral commitment. Their commitment technology allows banks to produce transferable private debt or deposits (through multilateral commitment) secured by illiquid assets (through bilateral commitment). And since transferable debt (deposits) commands a liquidity premium, the bank earns an intermediation spread, which provides the economic incentive for this process. In other words, inside money emerges through an institutional (social) mechanism to facilitate exchange in an economy of many participants unavoidably facing an absence of universal trust; as Kiyotaki and Moore (2001) famously paraphrase, "evil is the root of all money."

Kiyotaki and Moore find that in economies characterized by very low degrees of bilateral commitment, only outside money circulates. In economies with higher degrees of bilateral and multilateral commitment, both outside and inside money circulate in equilibrium. The more effective the economy is in generating credible commitment, the larger the stock of privately intermediated claims—deposits—that can circulate as money. Viewed from this perspective, a low level of cash (outside money) compared with bank deposits (inside money) in advanced economies such as Canada is not surprising. And it follows that a heavy reliance on bank deposits as money is also consistent with a large social investment in banking regulation and in policies to protect financial stability in general.

Appendix 2: Overview of the Canadian Bail-in Framework[23]

As noted in the backgrounder published by the Department of Finance along with the regulations to implement Canada's bail-in framework, "the 2008 financial crisis highlighted the fact that some banks are 'systemically important'—so important to the functioning of either the global financial system or to a domestic economy that their failure would impose unacceptable costs on the economy and financial system and, potentially, taxpayers."

In response, Canadian authorities designated the six largest Canadian banks as domestic systemically important banks (D-SIBs). Further, policy measures have been put in place to reduce the likelihood of failure for these banks, and to reduce the potential impact of any failure on taxpayers. This bank recapitalization regime will allow Canadian authorities to quickly convert a failing bank's preferred shares and certain debt instruments into common shares to recapitalize the bank and help restore it to viability.

The rest of this appendix summarizes the framework, as set out in legislation and related regulations.

Key features

Total Loss Absorbing Capacity (TLAC) requirement: The *Bank Act* requires D-SIBs to maintain a minimum capacity to absorb losses (TLAC), which is determined by the Superintendent of Financial Institutions. The purpose of the TLAC requirement is to provide sufficient loss-absorbing capacity to support recapitalization of any D-SIB under extreme stress. Beginning on November 1, 2021, D-SIBs are required by the Office of the Superintendent of Financial Institutions to maintain a minimum risk-based TLAC ratio of at least 21.5 per cent of risk-weighted assets. D-SIBs are also required to hold buffers above the minimum TLAC requirement.

TLAC composition: TLAC consists of common equity, preferred share, subordinated debt and bail-in debt. *All* preferred shares and subordinated debt instruments issued by a D-SIB are convertible to common equity and are known as non-viability contingent capital (NVCC). Bail-in debt is unsecured senior debt with an original maturity of 400 days that is tradable and transferable. The bail-in regime does not apply to deposits (e.g., chequing accounts, savings accounts and Guaranteed Investment Certificates), secured liabilities (e.g., covered bonds), eligible financial contracts (e.g., derivatives) or structured notes.

Disclosure: All TLAC instruments must indicate in their contractual terms that the instrument is subject to conversion into common shares at the discretion of Canadian authorities (regardless of the jurisdiction of issue).

Conversion terms: All NVCC instruments (preferred shares and subordinated debt) are subject to specific, predetermined conversion terms set out in their contracts. As regards bail-in debt, the bail-in regulations do not include fixed conversion terms. Instead, they provide the Canada Deposit Insurance Corporation (CDIC) with

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[23] This appendix draws on material posted on the CDIC website, which provides explanatory material as well as bail-in issuance, conversion and compensation regulations.

discretion to determine the conversion rate for bail-in debt subject to the following principles:

- Adequate recapitalization—CDIC must take into consideration the requirement in the *Bank Act* for banks to maintain adequate capital.
- Order of conversion—bail-in debt can be converted only after all NVCC instruments have been converted according to their contractual terms.
- Treatment of equally ranking instruments—equally ranking bail-in instruments must be converted in the same proportion (pro rata) and receive the same number of common shares per dollar of the claim that is converted.
- Relative creditor hierarchy—holders of bail-in eligible instruments must receive more common shares per dollar of the claim that is converted than holders of subordinate ranking bail-in eligible instruments and NVCC that have been converted.

Bail-in process

Determination by Superintendent and Governor in Council approval: The use of the bail-in conversion tool would require (i) a determination by the Superintendent of Financial Institutions that the bank has ceased, or is about to cease, to be viable, and (ii) Governor in Council approval, on the recommendation of the Minister of Finance, for CDIC to take temporary control or ownership of the non-viable bank and carry out a bail-in conversion.

CDIC taking control: CDIC would take temporary control or ownership of the non-viable bank. CDIC would execute a bail-in conversion to recapitalize the bank, and could undertake other measures necessary to restore the bank to viability.

Return to private control: After the completion of the bail-in conversion and other necessary measures, CDIC would return the bank to private control. The return to private control must happen within one year. The Governor in Council may, however, extend this time frame sequentially to a maximum total period of five years.

Offer of compensation: Following resolution, CDIC would make an offer of compensation to the relevant shareholders and creditors if they have been made worse off as a result of CDIC's actions than they would have been if the bank had been liquidated. CDIC's offer would be reviewed by a third-party assessor appointed by the Governor in Council if persons who hold 10 per cent of the value of a given class of shares or debt object to CDIC's offer. The assessor's own determination of compensation owed would be final and conclusive. The appointed third-party assessor is required to be a federal judge.